

Differential Eqns
MAP2302 3145

BP-class

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Note. Use **nz-** to mean **non-zero**.

Do **not** approx.: If your result is " $\sin(\sqrt{\pi})$ " then write that rather than .9797... Use " $f(x)$ notation" when writing fncs; in particular, for trig and log fncs. E.g, write " $\sin(x)$ " rather than the horrible $\sin x$ or $[\sin x]$.

BP1: OYOP: Carefully state the FTAalgebra, concerning a degree- N monic complex-polynomial.

Carefully *define* the **multiplicity** of a root of a poly. In poly

$$f(x) := x^4 - 5x^3 + 9x^2 - 7x + 2,$$

the multiplicity of root 1 is _____. [Hint: You can use differentiation.]

BP2: Show no work.

a Write $\frac{10}{1+2i} = \underline{\hspace{1cm}} + \underline{\hspace{1cm}} \cdot i$, both real.

b Using real exp, cos, sin, and i (and algebra), write $e^{7-3i} = \underline{\hspace{1cm}}$.

The complex number $\cos(5i)$ is (circle): zero, nz-real, nz-imaginary, neither-pure-real-nor-imag.

c In autonomous DE

$$y' = [y - 5]^3[y - 6][y - 7]^2[y - 8],$$

classify the equilibrium pts as Up, Dn, Att, Rep.

5: _____, 6: _____, 7: _____, 8: _____.

d As a power-series, write $\sin(3i) = \underline{\hspace{1cm}}$.

e Let $L := [D + 2I]^3[D - 7I]^2$. Then a gen.soln y to DE $L(y) = 0$ is

$$y(t) = \alpha \cdot \underline{\hspace{1cm}} + \beta \cdot \underline{\hspace{1cm}} + \underline{\hspace{1cm}}.$$

where α, β, \dots are arbitrary numbers. (You fill-in all the remaining terms.)

BP3: OYOP: Carefully state FTODE (Fund. Thm of ODEs).

The ODE $y'(t) = t + [3 \cdot y^{2/3}]$ does *not* satisfy the hypothesis of FTODE. **Explicitly** show me what hypothesis(es) fail.

BP4: Do these problems, *explaining* your method.

P.168: #27, #30, #40.

P.177: #27, #35, #36.

P.186: #27, #33.

P.194: #47.

P.220: #11, #12, #16.

P.251: #31-33, #36.

P.274: #2, #7, #9, #10, #28, #29.

Remember how to solve FOLDE and SOV problems, as they may be ingredients in solving a larger problem.

End of BP-class